United States Patent [19]

Payne

[11] **4,401,964**

[45] **Aug. 30, 1983**

[54] **COMBINED TEMPERATURE RESPONSIVE VALVE CONSTRUCTION AND ELECTRICAL SWITCH CONSTRUCTION AND METHOD OF MAKING THE SAME**

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[51] **Int. Cl.**³ **H01H 37/74**

[52] **U.S. Cl.** ..... **337/343**; 337/347; 200/83 P

[58] **Field of Search** ..... 337/343, 347; 200/83 P

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,553,402	1/1971	Hire	200/83
3,960,124	6/1976	Payne	337/401 X
4,121,074	10/1978	Orcutt et al.	200/83
4,200,776	4/1980	Poling	200/83 P
4,296,287	10/1981	Boulanger et al.	200/83 P

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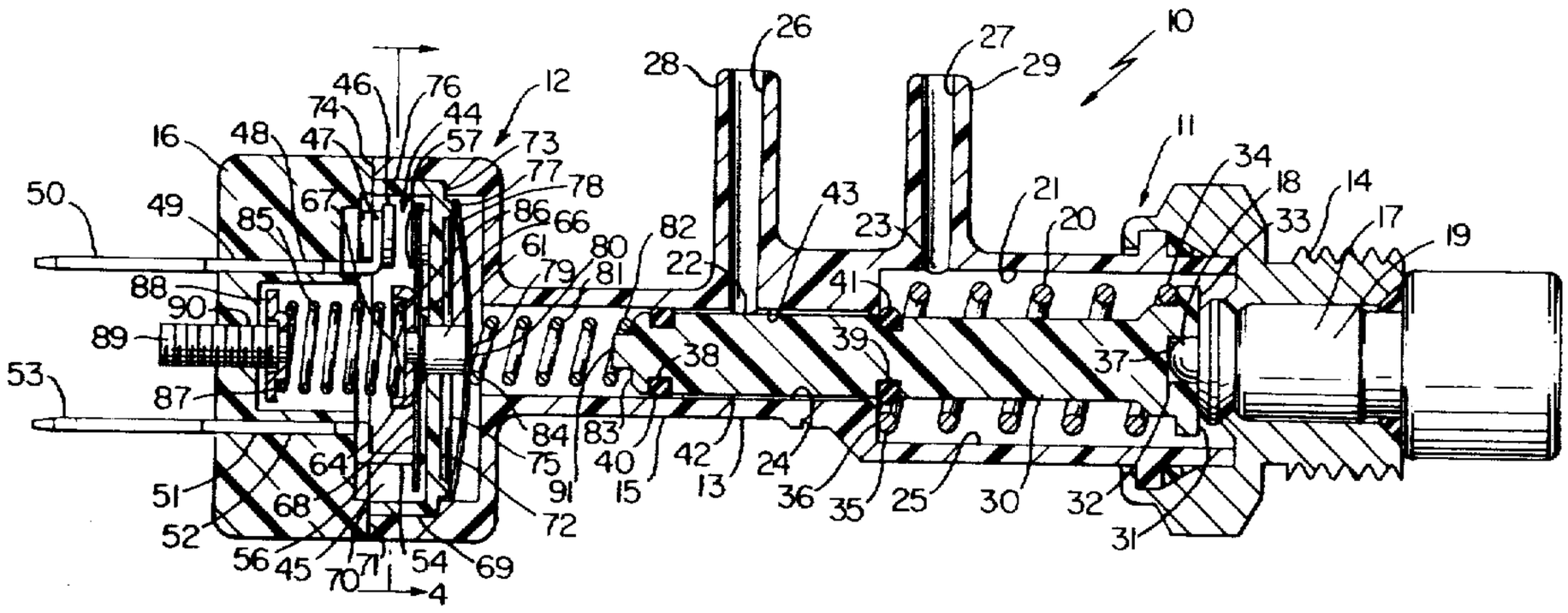
[57] **ABSTRACT**

A combined temperature responsive valve construction and an electrical switch construction wherein the valve construction has a thermally responsive device of the piston and cylinder type operating a movable valve member that is engaged by the piston of the device and operates an actuator of the switch construction, the valve member comprising an axially movable valve stem having opposed ends one of which is engaged by the piston of the device and the other of which operates the actuator. A coiled compression spring has one of the opposed ends thereof engaging a spring retaining part of the other end of the valve stem in a retained manner and the other opposed end thereof engaging the actuator whereby axial movement of the valve stem toward the actuator will tend to compress the spring therebetween.

24 Claims, 5 Drawing Figures



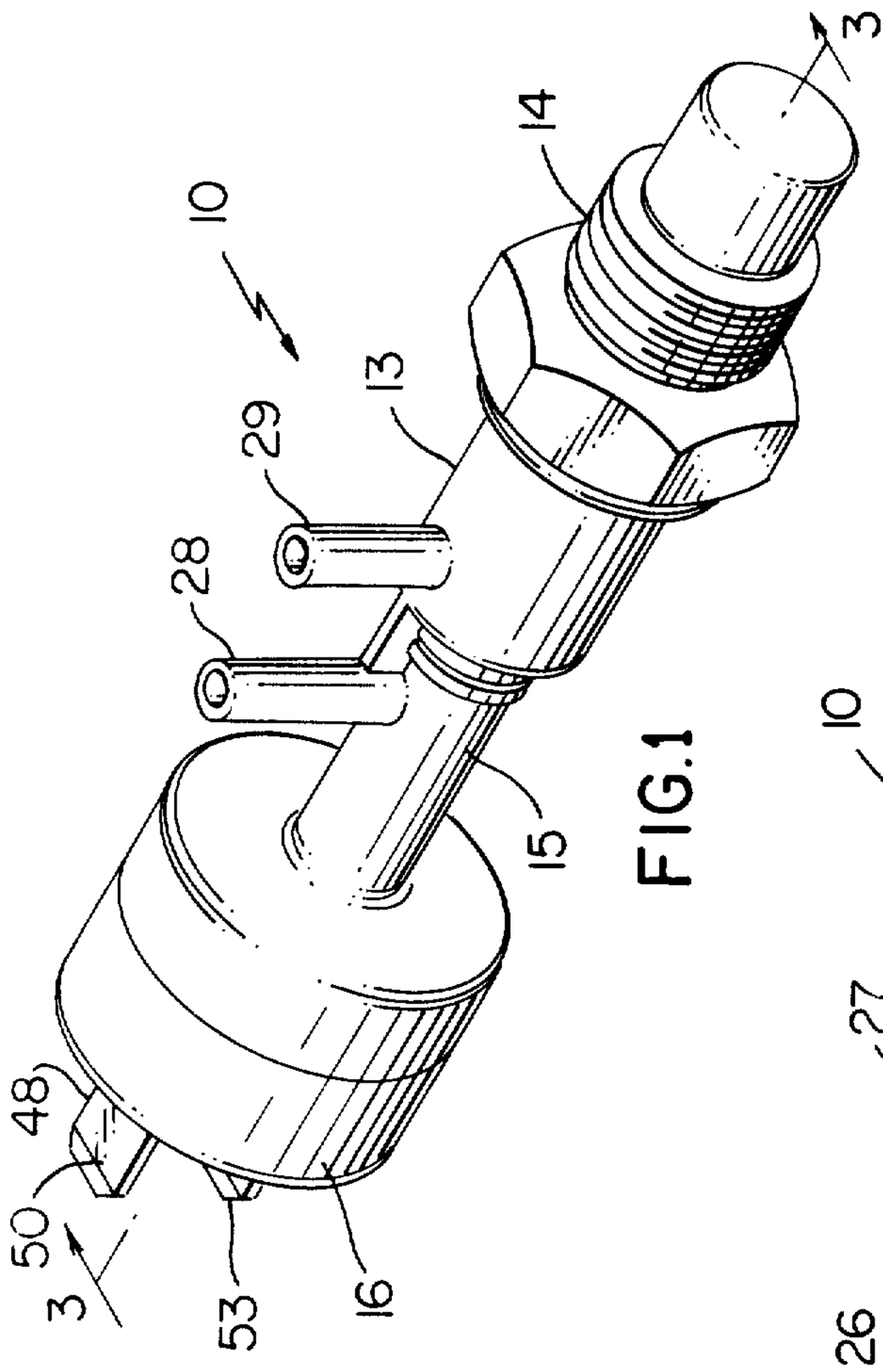


FIG.1

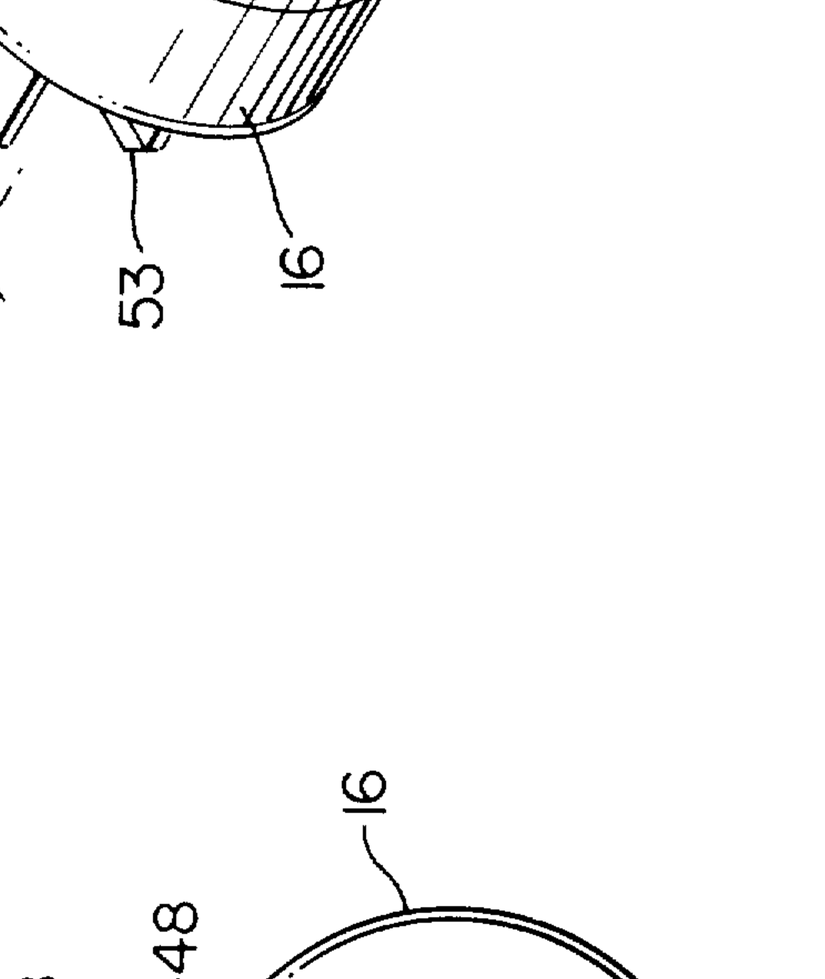


FIG.2

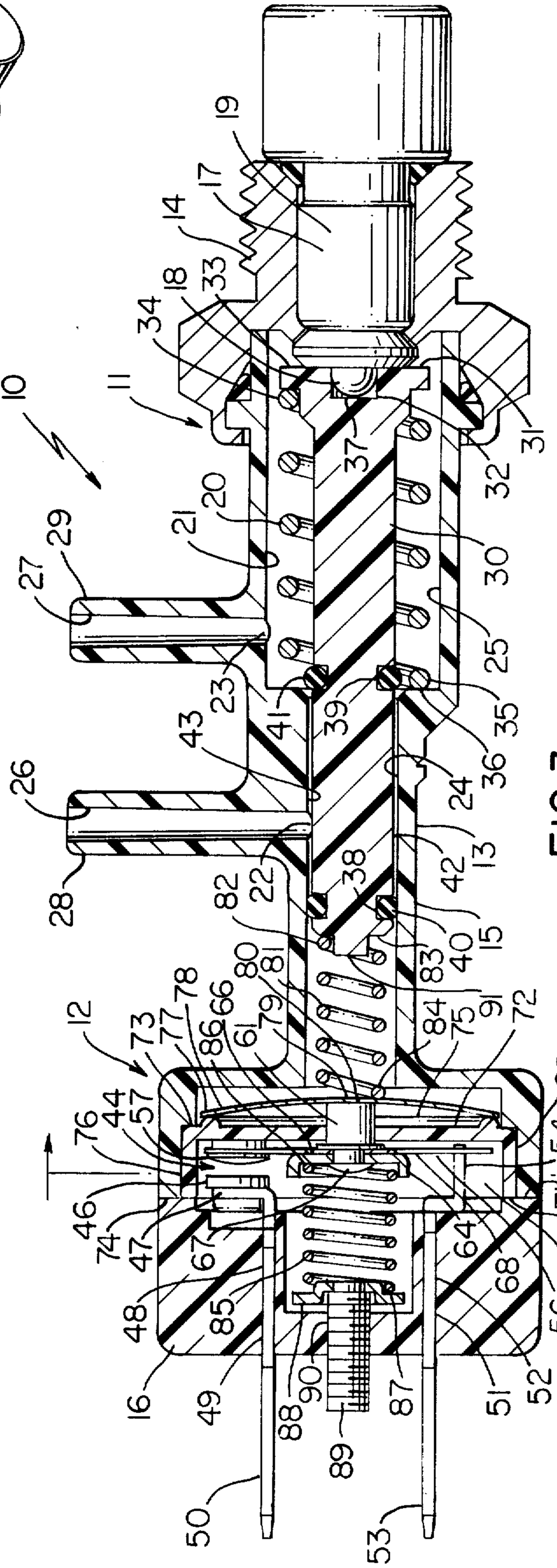


FIG.3

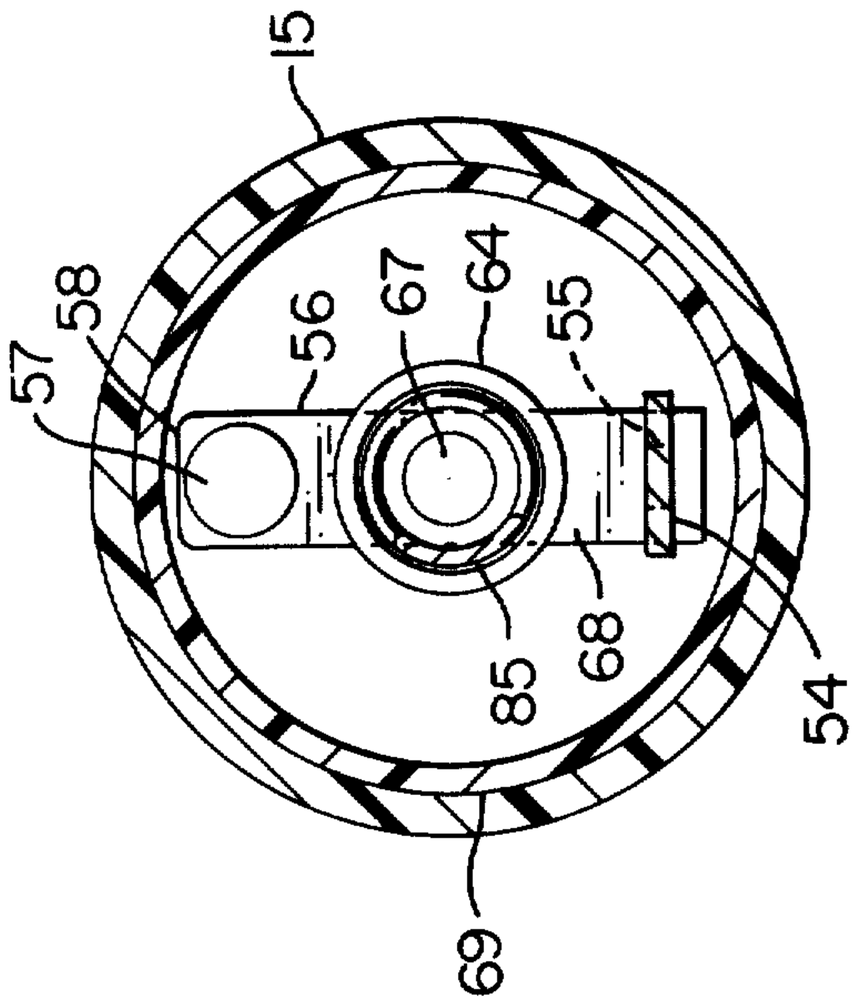

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FIG. 4

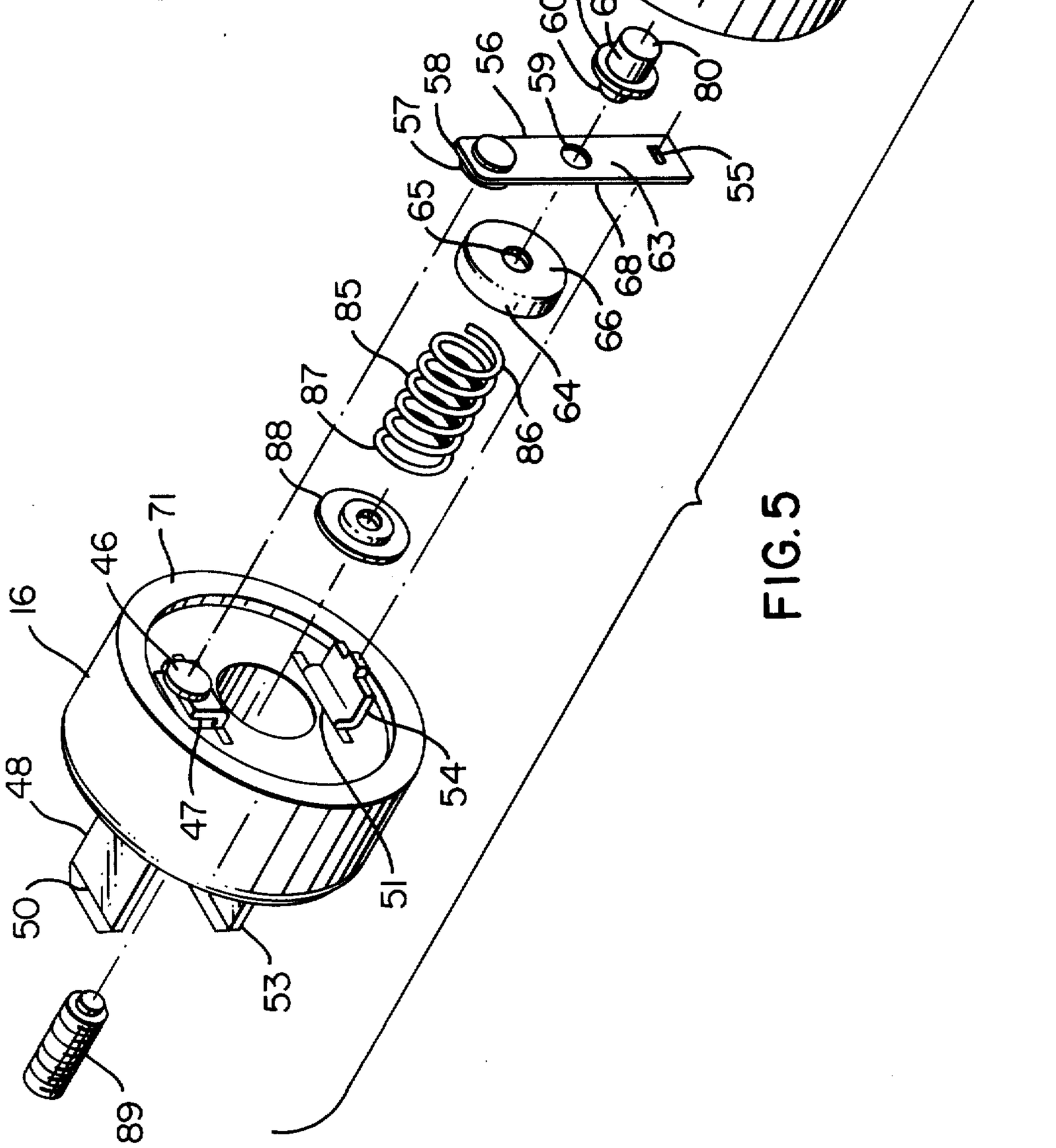
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FIG. 5

COMBINED TEMPERATURE RESPONSIVE VALVE CONSTRUCTION AND ELECTRICAL SWITCH CONSTRUCTION AND METHOD OF MAKING THE SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an improved combined temperature responsive valve construction and an electrical switch construction wherein the valve construction has a thermally responsive device of the piston and cylinder type, this invention also relating to an improved method of making such a combined temperature responsive valve construction and electrical switch construction.

2. Prior Art Statement

It is known to provide a combined temperature responsive valve construction and electrical switch construction wherein the valve construction has a thermally responsive device of the piston and cylinder type operating a movable valve member that is engaged by the piston of the device and that operates an actuator of the switch construction, the valve member comprising an axially movable valve stem having opposed ends one of which is engaged by the piston of the device and the other of which operates the actuator.

For example, see the following U.S. Patent: (1) U.S. Pat. No. 3,960,124—Payne.

It appears that the actuator of the combined temperature responsive valve construction and electrical switch construction of item (1) above comprises an insulating member that is directly engaged by the free end of the valve stem and carries a switch contact for movement relative to a fixed switch contact of the switch construction.

Another known combined temperature responsive valve construction and electrical switch construction has the piston means of the piston and cylinder device operate a ball valve member with the ball valve member acting on one end of a compression spring and with the other end of the compression spring acting on a snap disc of a snap-acting switch construction, the snap disc itself being part of the contact means for movement into engagement with a fixed contact means to provide the switching function of the device.

However, it is also known to provide a snap-acting switch construction wherein an insulating member is disposed between the snap disc and the movable switch blade of the switch construction so that the snap disc is not a current carrying member.

For example, see the following two U.S. Patents: (2) U.S. Pat. No. 3,553,402—Hire, (3) U.S. Pat. No. 4,121,074—Orcutt et al.

It appears that the snap-acting switch construction of item (2) above is pressure operated and the insulating member disposed between the snap disc thereof and a movable contact member actually carries the movable contact member in a manner to bridge a pair of terminals carried by the construction, the switch construction carrying an adjustable compression spring acting on the movable contact member in a direction opposite to the snap direction of the snap disc.

It appears that the pressure operated snap-acting switch construction in FIG. **10** of item (3) above has an insulating wall disposed between the snap disc and a movable switch blade carried by one of the terminals of the switch construction and through which an actuator is disposed to transmit movement of the snap disc to the switch blade so as to place its contact into contact with another terminal of the switch construction.

SUMMARY OF THE INVENTION

It is one feature of this invention to provide an improved combined temperature responsive valve construction and electrical switch construction wherein the valve construction has a thermally responsive device of the piston and cylinder type.

In particular, it was found according to the teachings of this invention that the prior known combined temperature responsive valve construction and electrical switch construction of applicant's earlier issued U.S. Pat. No. 3,960,124 could be improved if the same has the electrical switch means thereof be snap-acting rather than be of the slow make and break type.

Therefore, it was found according to the teachings of this invention that a snap disc could be utilized and the valve stem could act on the snap disc through the use of a compression spring so as not only to actuate the snap disc, but to also provide for overrun movement of the thermally responsive device. In this manner, it was found that the resulting combined temperature responsive valve construction and electrical switch construction of this invention has a high current rating and can be callibrated to a close tolerance.

For example, one embodiment of this invention provides a combined temperature responsive valve construction and electrical switch construction wherein the valve construction has a thermally responsive device of the piston and cylinder type operating a movable valve member that is engaged by the piston of the device and operates an actuator of the switch construction, the valve member comprising an axially movable valve stem having opposed ends of which is engaged by the piston of the device and the other of which operates the actuator and has a spring retaining means. A coiled compression spring has one of the opposed ends thereof engaging the spring retaining means of the other end of the valve stem in a retained manner and the other opposed end of the spring engaging the actuator whereby axial movement of the valve stem toward the actuator will tend to compress the spring therebetween.

Accordingly, it is an object of this invention to provide an improved combined temperature responsive valve construction and electrical switch construction having one or more of the novel features of this invention as set forth above or hereinafter shown or described.

Another object of this invention is to provide a method of making such a combined temperature responsive valve construction and electrical switch construction, the method of this invention having one or more of the novel features of this invention as set forth above or hereinafter shown or described.

Other objects, uses and advantages of this invention are apparent from a reading of this description which proceeds with reference to the accompanying drawings forming a part thereof and wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view illustrating the improved combined temperature responsive valve construction and electrical switch construction of this invention.

FIG. **2** is an end view of the combined temperature responsive valve construction and electrical switch construction of FIG. **1**.

FIG. 3 is an enlarged cross-sectional view taken on line 3—3 of FIG. 1.

FIG. 4 is a cross-sectional view taken on line 4—4 of FIG. 3.

FIG. 5 is an exploded perspective view of the switch construction part of the combined temperature responsive valve construction and electrical switch construction of FIGS. 1 and 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

While the various features of this invention are hereinafter described and illustrated as being particularly adapted to provide a combined temperature responsive valve construction and electrical switch construction to be utilized with an internal combustion engine as set forth in the U.S. Pat. No. 3,960,124, it is to be understood that the various features of this invention can be utilized singly or in various combinations thereof to provide a combined temperature responsive valve construction and electrical switch construction for use with other structures as desired.

Therefore, this invention is not to be limited to only the embodiment illustrated in the drawings, because the drawings are merely utilized to illustrate one of the wide variety of uses of this invention.

However, in order to fully understand a typical use of the improved unit of this invention, reference can be made to such U.S. Pat. No. 3,960,124 for a full disclosure thereof and, therefore, the U.S. Pat. No. 3,960,124 is being incorporated into this disclosure by reference thereto.

Referring now to FIGS. 1–3, the improved combined temperature responsive valve construction and electrical switch construction or unit of this invention is generally indicated by the reference numeral **10** with the temperature responsive valve construction or portion thereof being generally indicated by the reference numeral **11** and the electrical switch construction or portion thereof being generally indicated by the reference numeral **12**, the constructions **11** and **12** being interconnected together by a housing means **13** formed from a plurality of housing parts **14**, **15** and **16** suitably secured together as illustrated in FIG. **3**.

The thermally responsive valve construction **11** includes a thermally responsive device **17** of the piston and cylinder type wherein a piston **18** is carried by a cylinder means **19** to be extended out of the same when a wax charge or the like in the cylinder **19** has the volume thereof increased by sensing a predetermined temperature and being retracted into the cylinder **19** under the force of a compression spring **20** when the wax charge or the like in the cylinder **19** decreases in volume because of sensing a temperature below the predetermined temperature in a manner well known in the art.

The housing part **14** is secured to the cylinder **19** of the thermally responsive device **17** so that the device **17** is carried by the housing means **13** and has the piston **18** thereof projecting into a stepped bore means **21** passing axially through the housing member **15**.

The housing member **15** has a pair of ports **22** and **23** respectively interrupting a small section **24** of the bore **21** and a large section **25** of the bore **21** as illustrated, the ports **22** and **23** comprising the inner ends of a pair of passage means **26** and **27** passing respectively through a pair of outwardly directed nipples **28** and **29** formed integrally with the housing member **15**, such as by molding or the like of suitable plastic material or the like.

A plunger-like valve stem **30** is disposed in the stepped bore **21** of the housing member **15** and has one end **31** thereof interrupted by a bore **32** which is adapted to receive the piston **18** therein as illustrated in FIG. **3**, the end **31** of the valve stem **30** having an annular flange **33** against which one end **34** of the compression spring **20** engages while the other end **35** of the spring **20** engages against a shoulder **36** of the housing member **13** defined between the bore sections **24** and **25** as illustrated. In this manner, the force of the compression spring **20** maintains a closed end **37** of the valve stem **30** against the piston **18** of the thermally responsive device **17** so as to follow movement thereof in a manner well known in the art.

The valve stem **30** has a pair of spaced apart annular grooves **38** and **39** formed therein and respectively receiving annular resilient O-ring like members **40** and **41** which extend respectively radially outwardly from the external peripheral surface **42** of the valve stem **30**.

In this manner, the resilient seal member **40** seals against the internal peripheral surface **43** of the housing member **15** in the bore section **24** while the resilient O-ring member **41** is adapted to seal against such surface **43** when the same is moved into the bore section **24** upon the extension of the piston **18** out of the cylinder **19** of the thermally responsive device **17**. However, when the thermally responsive device **17** is sensing a temperature below the previously described predetermined temperature, the seal member **41** is spaced from the shoulder **36** of the housing member **15** so that the ports **22** and **23** are fluidly interconnected together as the external peripheral surface **42** of the valve stem **30** is spaced inwardly from the internal peripheral surface **43** of the bore section **24** as illustrated in FIG. **3**. However, when the piston **18** of the thermally responsive device **17** is extended to the left in FIG. **3** a sufficient distance to cause the seal member **41** to be received in the bore section **25** and seal against the internal peripheral surface **43** thereof, fluid communication between the ports **22** and **23** is terminated in a manner well known in the art.

In all positions of the valve stem **30**, the seal **40** seals the ports **22** and **23** from the switch construction **12**.

The electrical switch construction **12** of the unit **10** comprises an electrical switch means that is generally indicated by the reference numeral **44** disposed in a chamber **45** formed between the cooperating housing members **15** and **16**.

The switch means **44** includes a fixed contact **46** carried on an end **47** of a terminal **48** passing through an opening means **49** in the housing member **16** so that its outer end **50** is adapted for external electrical interconnection purposes.

Similarly, another terminal **51** passes through an opening means **52** in the housing member **16** so that its outer end **53** is adapted for external electrical connection purposes while its inner end **54** is received in an opening **55**, FIG. **5**, of a switch blade **56** that carries an electrical contact **57** on the outer end **58** thereof and thereby comprises a movable contact cooperable with the fixed contact **46** as will be apparent hereinafter as the blade **56** is riveted on the end **54** of the terminal **51**.

The switch blade **56** has an opening **59** passing therethrough and receiving a reduced end **60** of an electrically insulating actuating member **61**, the actuating member **61** having an annular flange **62** which abuts

against the side **63** of the switch blade **56** when the reduced portion **60** is fully telescoped through the opening **59** of the switch blade **56** as illustrated in FIG. **3**.

A cup-shaped spring retainer **64** has an opening **65** passing through the closed end **66** thereof and receives the reduced portion **60** of the actuating member **61** therein which is subsequently turned over to form a rivet head **67** so as not only to secure the actuating member **61** to the switch blade **56**, but also to secure the spring retainer **64** thereto with its end wall **66** disposed against the side **68** of the switch blade **56** as illustrated in FIG. **3**.

An electrically insulating cup-shaped member **69** is disposed in the chamber **45** and has its open end **70** disposed against the end **71** of the housing member **16** while its closed end **72** is engaged by an internal shoulder **73** of the housing member **15** when the housing member **15** has its end **74** secured to the end **71** of the housing member **16** in any suitable manner whereby the cup-shaped member **69** is prevented from movement in the chamber **45**.

The closed end **72** of the cup-shaped member **69** has an annular flange or bead **75** disposed inboard of the outer peripheral surface **76** of the cup-shaped member **69** and is adapted to be engaged by the outer peripheral portion **77** of a metallic snap disc or actuator **78** which is carried in the chamber **45** of the housing means **13** and has its medial portion **79** engaging against the end **80** of the electrically insulating actuating member **61** as illustrated in FIG. **3**.

A coiled compression spring **81** is disposed in the stepped bore **21** of the housing means **13** and has one end **82** bearing against the free end or end surface **83** of the valve stem **30** while the other end **84** of the spring **81** bears against the medial portion **79** of the snap disc or actuator **78** in coaxial alignment with the actuating member **61** so that the medial portion **79** of the snap disc **78** will be urged to the left in FIG. **3** by the force of the compression spring **81** between the end **83** of the valve stem **80** and the medial portion **79** of the snap disc **78**.

As will be apparent hereinafter, suitable callibration of the electrical switch means **44** will cause the snap disc **78** to snap over center and have its medial portion **79** moved in a snap manner to the left in FIG. **3** when the force of the compression spring **81** has been increased by the valve stem **30** being moved to the left by the extending piston **18** of the thermally responsive device **17** a certain distance so that the movable contact **57** will be snapped against the fixed contact **56** to complete the electrical circuit between the terminals **48** and **51**.

Conversely, when the force of the compression spring **81** is relaxed sufficiently to cause the medial portion **79** of the snap disc **78** to snap back to the right as illustrated in FIG. **3**, the switch blade **56** is adapted to snap the movable contact **57** away from the fixed contact **46** by the force of a coiled compression spring **85** disposed in the chamber **45** and having one end **86** thereof bearing against the closed end **66** of the cup-shaped spring retainer **64** while the other end **87** thereof bears against a spring retainer **88** carried on a threaded adjusting member **89** threadedly disposed in a threaded bore **90** of the housing member **16**.

In this manner, the force of the compression spring **85** tending to hold the switch blade **56** against the closed end **72** of the cup-shaped member **69** can be adjusted by changing the axial threaded relation between the threaded adjusting member **89** and the threaded bore **90** of the housing member **16**.

The end **82** of the compression spring **81** that acts on the snap disc **78** is positively located in a retained manner on the end **83** of the valve stem **30** because the end **83** of the valve stem **30** has an integral projection **91** extending therefrom and being telescopically received in the end **82** of the coiled spring **81** so that the coiled spring **81** will be properly axially aligned not only with the valve stem **30** and the actuating member **61**, but is also axially aligned with the compression spring **85** as illustrated. Thus, the end surface **83** and projection **91** of the valve stem **30** define a spring retaining means thereof.

Therefore, it can be seen that the combined temperature responsive valve construction and electrical switch construction or unit **10** of this invention can be formed in a relatively simple manner by the method of this invention as previously set forth to operate in a manner now to be described.

Assuming that the unit **10** is being utilized with an internal combustion engine in the same manner as the unit of the aforementioned U.S. Pat. No. 3,960,124 and has the temperature responsive device **17** sensing a temperature of the engine that is below the predetermined temperature that causes the piston **18** to be extended from the cylinder **19**, the unit **10** is in the condition illustrated in FIG. **3** wherein the sealing member **41** is spaced to the right from the shoulder **36** of the housing member **15** so that fluid communication is permitted between the ports **22** and **23** for any desired control purpose. Also, because the piston **18** is fully retracted in the cylinder **19** so that the end **31** of the valve stem **30** is against the cylinder **19** under the force of the compression spring **20**, the force of the compression spring **81** is not sufficient to overcome the force of the compression spring **85** and the snap disc **78** so that the snap disc **78** is in the bowed condition illustrated in FIG. **3** wherein the medial portion **79** thereof is to the right and the compression spring **85** holds the switch blade **56** against the closed end **72** of the cup-shaped member **69** whereby the switch means **44** is in an open condition as the movable contact **57** is held out of contact with the fixed contact **46** so that an electrical circuit between the terminals **48** and **51** is prevented.

However, upon the device **17** sensing a temperature above the predetermined temperature, the piston **18** is extended to the left in FIG. **3** out of the cylinder **19** in opposition to the force of the compression spring **20** and axially moves the valve stem **30** to the left in FIG. **3** a sufficient distance so that the annular sealing member **41** enters the bore section **24** and seals against the internal peripheral surface **43** of the housing member **15** to terminate fluid communication between the ports **22** and **23**. Also, when the valve stem **30** has been moved to the left in FIG. **3** a sufficient distance, the resulting increase in the compressive force of the compression spring **81** overcomes the force of the snap disc **78** and the compression spring **85** to snap the medial portion **79** of the snap disc **78** to the left in FIG. **3** and thereby snap the switch blade **56** to the left so that its contact **57** will be snapped into electrical contact with the fixed contact **46** to complete the electrical circuit between the terminals **48** and **51**.

As long as the piston **18** remains extended from the cylinder **19** of the device **17** by the device **17** sensing a temperature at the predetermined temperature or

above, the switch means **44** remains closed and the port means **22** and **23** remain sealed from each other.

However, when the temperature being sensed by the device **17** falls below the predetermined temperature, the force of the compression spring **20** is adapted to retract the piston **18** into the cylinder **19** and thereby move the valve stem **30** back to the condition illustrated in FIG. **3** wherein not only is the sealing member **41** now moved away from the bore section **24** so that the ports **22** and **23** are again in fluid communication with each other, but also the force of the compression spring **81** has been diminished sufficiently that the force of the compression spring **85** and the natural bias of the snap disc **78** causes the medial portion **79** of the snap disc **78** to snap back to the condition illustrated in FIG. **3** and thereby permit the compression spring **85** to move the movable contact **56** with a snap action away from the fixed contact **46** to again open the electrical switch means **44**.

From the above, it can readily be seen that the electrical switch means **44** can have a high current rating and can be calibrated to a close tolerance through the adjusting member **89** in the manner previously set forth.

Therefore, it can be seen that this invention not only provides an improved combined temperature responsive valve construction and electrical switch construction, but also this invention provides an improved method of making such a combined temperature responsive valve construction and electrical switch construction.

While the form and method of this invention now preferred has been described and illustrated as required by the Patent Statute, it is to be understood that other forms and method steps can be utilized and still fall within the scope of the appended claims.

What is claimed is:

1. In a combined temperature responsive valve construction and an electrical switch construction wherein said valve construction has a thermally responsive device of the piston and cylinder type operating a movable valve member that is engaged by said piston of said device and that operates an actuator of said switch construction, said valve member comprising an axially movable valve stem having opposed ends one of which is engaged by said piston of said device and the other of which operates said actuator, the improvement wherein said other end of said valve stem has spring retaining means, and a coiled compression spring having opposed ends one of which engages in a retained manner said spring retaining means of said other end of said valve stem and the other of which engages said actuator whereby axial movement of said valve stem toward said actuator will tend to compress said spring therebetween.

2. A combined temperature responsive valve construction and an electrical switch construction as set forth in claim **1** wherein said other end of said valve stem has an end surface with a projection thereon and received in said one end of said spring to act as a spring retainer therefor, said one end of said spring engaging said end surface whereby said projection and said end surface of said valve stem define said spring retaining means thereof.

3. A combined temperature responsive valve construction and an electrical switch construction as set forth in claim **2** wherein said valve stem has a plurality of spaced apart annular grooves therein, and a plurality of annular sealing members respectively disposed in said annular grooves to provide a sealing function with said valve stem.

4. A combined temperature responsive valve construction and an electrical switch construction as set forth in claim **3** wherein said valve stem comprises a one-piece member.

5. A combined temperature responsive valve construction and an electrical switch construction as set forth in claim **1** wherein said switch construction has a snap-acting electrical switch means.

6. A combined temperature responsive valve construction and an electrical switch construction as set forth in claim **5** wherein said actuator comprises a snap disc and thereby provides the snap-acting function for said electrical switch means.

7. A combined temperature responsive valve construction and an electrical switch construction as set forth in claim **6** wherein said electrical switch means includes a movable switch blade having a bias means that tends to cause said switch blade to remain in one operating position thereof, and an electrical insulating actuator member disposed between said switch blade and said snap disc to transmit movement of said snap disc to said switch blade and thereby move said switch blade to another operating position thereof.

8. A combined temperature responsive valve construction and an electrical switch construction as set forth in claim **7** wherein said electrical switch means includes a cup-shaped member having a closed end and open end, said closed end having an opening therethrough and telescopically receiving said actuator member for axial movement therein, said closed end being intermediate said switch blade and said snap disc.

9. A combined temperature responsive valve construction and an electrical switch construction as set forth in claim **8** wherein said closed end of said cup-shaped member has an annular flange thereon and against which said snap disc engages.

10. A combined temperature responsive valve construction and an electrical switch construction as set forth in claim **9** wherein said bias means of said switch blade comprises another coiled compression spring, and adjusting means carried by said switch construction for adjusting the force of said other compression spring.

11. A combined temperature responsive valve construction and an electrical switch construction as set forth in claim **10** wherein said other spring acts on said switch blade in a direction opposite to the direction said first-named spring acts on said snap disc.

12. A combined temperature responsive valve construction and an electrical switch construction as set forth in claim **11** wherein said springs and said valve stem are disposed in axially aligned relation.

13. In a method of making a combined temperature responsive valve construction and an electrical switch construction wherein said valve construction has a thermally responsive device of the piston and cylinder type operating a movable valve member that is engaged by said piston of said device and that operates an actuator of said switch construction, said valve member comprising an axially movable valve stem having opposed ends one of which is engaged by said piston of said device and the other of which operates said actuator, the improvement comprising the steps of forming said other end of said valve stem to have spring retaining means, and disposing a coiled compression spring so that one opposed end thereof engages said spring retaining means of said other end of said valve stem in a retained

manner and the other opposed end thereof engages said actuator whereby axial movement of said valve stem toward said actuator will tend to compress said spring therebetween.

14. A method of making a combined temperature responsive valve construction and an electrical switch construction as set forth in claim **13** and including the steps of forming said other end of said valve stem to have an end surface with a projection thereon, and telescoping said projection in said one end of said spring to act as a spring retainer therefor and cause said one end of said spring to engage said end surface whereby said projection and said end surface of said valve stem define said spring retaining means thereof.

15. A method of making a combined temperature responsive valve construction and an electrical switch construction as set forth in claim **14** and including the steps of forming said valve stem with a plurality of spaced apart annular grooves therein, and disposing a plurality of annular sealing members respectively in said annular grooves to provide a sealing function with said valve stem.

16. A method of making a combined temperature responsive valve construction and an electrical switch construction as set forth in claim **15** and including the step of forming said valve stem to comprise a one-piece member.

17. A method of making a combined temperature responsive valve construction and an electrical switch construction as set forth in claim **13** and including the step of forming said switch construction to be a snap-acting electrical switch means.

18. A method of making a combined temperature responsive valve construction and an electrical switch construction as set forth in claim **17** and including the step of forming said actuator to comprise a snap disc and thereby provide the snap-acting function for said electrical switch means.

19. A method of making a combined temperature responsive valve construction and an electrical switch construction as set forth in claim **18** and including the steps of forming said electrical switch means with a movable switch blade having a bias means that tends to cause said switch blade to remain in one operating position thereof, and disposing an electrical insulating actuator member between said switch blade and said snap disc to transmit movement of said snap disc to said switch blade and thereby move said switch blade to another operating position thereof.

20. A method of making a combined temperature responsive valve construction and an electrical switch construction as set forth in claim **19** and including the steps of forming said electrical switch means to include a cup-shaped member having a closed end and open end, forming an opening through said closed end, and telescopically disposing said actuator member in said opening for axial movement therein whereby said closed end is intermediate said switch blade and said snap disc.

21. A method of making a combined temperature responsive valve construction and an electrical switch construction as set forth in claim **20** and including the steps of forming said closed end of said cup-shaped member to have an annular flange thereon, and engaging said snap disc against said flange.

22. A method of making a combined temperature responsive valve construction and an electrical switch construction as set forth in claim **21** and including the steps of forming said bias means of said switch blade to comprise another coiled compression spring, and disposing adjusting means to be carried by said switch construction for adjusting the force of said other compression spring.

23. A method of making a combined temperature responsive valve construction and an electrical switch construction as set forth in claim **22** and including the step of causing said other spring to act on said switch blade in a direction opposite to the direction said first-named spring acts on said snap disc.

24. A method of making a combined temperature responsive valve construction and an electrical switch construction as set forth in claim **23** and including the step of disposing said springs and said valve stem so that the same are in axially aligned relation.

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